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hairs. The shape of the scales changes rapidly with the centripetal advance. The outer and smaller ones are nearly orbicular. From this shape they broaden into ovate, and then into oblanceolate. It will happen in some buds, not in all, that scales will occur showing a retuse apex; then some more deeply emarginate and much narrower. Lastly, there will be one showing in the apical cleft a trace of true pinnation in the leaves.

The foliage proper consists of leaves, varying in number, standing erect upon the petioles and convolutely packed. Each of the leaflets is involutely rolled, and all are closely appressed. A sticky and sweetly odorous exudation helps to guard the leaves.

In full development the inner scales, several inches in length, become reflexed, and, with their beautiful salmon color, passing into green, or even of a rich claret red, resemble the petals of some gorgeous flower.—WILLIAM WHITMAN BAILEY, *Brown University*.

ABNORMAL LEAVES AND FLOWERS.

MR. FOERSTE'S interesting article on "Curious leaves" in the June GAZETTE induces me to place on record a couple of instances which I



FIG. 1.

have lately observed here in Mesilla. One day Professor E. O. Wooton brought in a handful of *Clematis ligusticifolia*, which was placed in a bowl for ornament. Looking over it, I was surprised to see that many of the flowers had two of the petaloid sepals coalesced for more than half their length (*fig. 1*, from a dried flower).



FIG. 2.

At about the same time, raising some *Solanum elaeagnifolium* from seed, I found a seedling in which the cotyledons were coalesced for over half their length (*fig. 2*), so that the plant was no longer dicotyledonous.

These examples, as also, perhaps, Mr. Foerste's *figs. 1* and *2*, are the result of abnormal coalescence. In the case of Mr. Foerste's elm leaves the interpretation is more obscure; but at all events, they have nothing to do with the other cases figured (*figs. 3* and *4*) by Mr. Foerste, in which we have simply an arrest of the central axis.

There is a cottonwood (*Populus Fremontii*) here in Mesilla which

produces growths having the form of bunches of grapes, consisting of great numbers of stalks on a central axis, each bearing a dense rounded mass of small aborted leaves.—T. D. A. COCKERELL, *Mesilla*, *N. M.*

STOMATA ON THE BUD SCALES OF ABIES PECTINATA.

In the *Metaspermæ* stomata occur on all normal leaves. They are also usually found on all of their well developed bud scales.

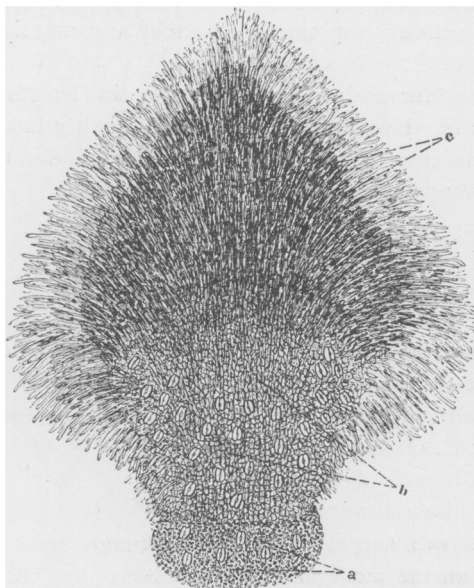


FIG. 1.—Dorsal surface of one of the bud scales of *Abies pectinata*, with stomata; *a*, a part of the axis and decurrent swelling, or pulvinus at the base of the scale; *b*, part of the scale which was covered over by the next lower bud scales, showing stomata; *c*, part of the scale which was exposed to the atmosphere. Epidermal cells thick walled and sclerotic. No stomata.

The needle like leaves of the *Coniferæ* are smaller, and hence have fewer stomata than the leaves of the *Metaspermæ*. On this account one would expect to find fewer or no stomata on their morphological equivalents, the bud scales. This has been found to be true, and it has always been thought that stomata never occur on the bud scales of the *Coniferæ*.

Grüss¹ says that stomata are never present on the bud scales of the *Coniferæ*. Schumann² makes the same statement. In a recent paper³ the writer called attention to the occurrence of stomata on the bud scales of *Abies pectinata*.

Normal leaves of *A. pectinata* have stomata only on their lower surfaces, where

¹ GRÜSS, J.: Beiträge zur Biologie der Knospe. Jahrbücher für wissen. Botanik 23:642.

² SCHUMANN, C. R. G.: Anatomische Studien über die Knospenschuppen von Coniferen und dicotylen Holzgewächsen. Bibliotheca Botanica 15:3. 1889.

³ Ueber abnorme Bildung von Harzbehältern, etc. Sonderabdruck aus der Forst.-naturw. Zeitsch. 1896. S. 15.